Use of Building Information Modelling Tools for Structural Health Monitoring

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Abstract*—The study of Information and Communication Technology applications in construction industry have developed greatly for computer programming and management strategies. As a response to the increasing challenges of construction projects, extensive researches have brought about numerous ICT tools such as Building Information Modelling tools, Lean Construction and Lean Design tools, and Integrated Project Delivery management tools to succour the construction industry. Building Information Modelling in particular is acknowledged in the industrial and academic circles as the new Computer Aided Design paradigm and hence, repositions it as the preferred approach to managing design, construction, maintenance and documentation of building projects. But the use of Building Information Modelling tools for structural health monitoring have not been adequately explored. This study employs Building Information Modelling as a tool for diagnosing and correcting structural design flaws in a building under construction. The design flaws in a complex staircase was identified while more realistic options of the design were quickly created and articulated for a safer outcome of the project. The results obtained highlights the benefits of Building Information Modelling applications such as enhanced safety, improved cost, time savings, quality improvements and better project management and execution.

***Keywords*—Building information modelling; Structural health; Building design; Project management**

I. INTRODUCTION

The study of Information and Communication Technology (ICT) applications in construction industry is a fast developing sector especially for computer programming and management strategies. Practitioners and researchers alike are offered a wide range of ICT techniques and management viewpoints thought to be the ideal solution to the construction industry's level of complexity the modern day structures [1]. Nevertheless, the rapid developments in the ICT have brought forth considerable applications and strategies capable of reducing the encumbrances and complexities of the construction industry. Areas of greater focus according to Björk [2] include product data technology, Electronic Data Interchange (EDI), concurrent engineering, lean construction, business process reengineering, total quality management, supply-chain management, just-in-time production and Building Information Modeling (BIM). BIM in particular unites design, construction, maintenance, management and documentation of built environment activities such that it improves the management decisions of the project stakeholders and enhances the benefits derivable from a constructed facility although it life cycle.

Construction projects are turning more difficult and challenging to manage because of the multifaceted nature of the Architecture, Engineering, Construction (AEC) and Facility Management (FM) industry. The high demand for information for design, evaluation, and collaboration increases the industry's need for information communication technologies. These complexities include structural safety, economic efficiency, constructability, and effective team collaboration for construction productivity in the AEC industry as well as the interdependent relationship existing between different stakeholders, such as Financing Bodies, Authorities, Architects, Engineers, Lawyers, Contractors, and Suppliers [3]. As a response to the increasing challenges of construction projects, extensive researches have brought about numerous ICT tools such as Building Information Modeling (BIM), Lean Construction and Lean Design, and Integrated Project Delivery (IPD) to succour the construction industry [4]. BIM in particular is acknowledged in the industrial and academic circles as the new Computer Aided Design (CAD) paradigm [5], hence, repositioning BIM as the preferred approach to managing design, construction, maintenance and documentation of building projects. Succar [5] defined BIM as "a set of interacting policies, processes and technologies generating a methodology to manage the essential building format throughout the and manages graphics together with the whole lots of information the building teams need to make better-informed decisions. Succar's definition highlights the BIM's holistic capabilities by interposing software tools for geometrical modelling information exchange and project management (PM)-related tools and processes [6]. BIM integrates common information defining a

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